

CELESTRON[®]

**FIRSTSCOPE 70 AZ
FIRSTSCOPE 80 AZ
C102-AZ
REFRACTING TELESCOPES**

INSTRUCTION MANUAL

Models # 21080 and 21080-AL

Models # 21075 and 21075-AL

Model # 21011

ASSEMBLING YOUR TELESCOPE

FIRSTSCOPE AZ TELESCOPE

The Firstscope AZ is a refractor telescope offered on an Altazimuth mount. The C102-AZ is similar to the Firstscope AZ and all text referred to in this manual on the Firstscope AZ applies equally to the C102-AZ. The telescope is shipped in one box which contains the optical tube, altazimuth mount and all the standard accessories, which include:

- 25mm SMA Ocular 1-1/4" (36x) - with 70mm and 80mm models
- 6mm F Ocular 1-1/4" (150x) - with 70mm only
- 20mm Plossl Ocular 1-1/4" (50x) - with 102mm only
- 6x30 Finderscope (for the 80mm and 102mm); 5x24 (for the 70mm)
- 45° Erect Image Diagonal 1-1/4"
- Slow Motion Controls
- Adjustable Wood Tripod (some models have an aluminum tripod)

Unpacking Your Firstscope AZ

Use the accompanying diagram (on page 3) to identify the various parts of your telescope for assembly and ongoing use.

When setting up the telescope, find a large, clear area where the parts can be laid out. Remove the contents of the box and place them neatly on your work surface. Once your refractor has been unpacked and assembled, you will not need the boxes for everyday storage and transportation. However, you should save the box in case you need to ship your telescope via a common carrier.

Setting Up the Wood Tripod

To begin setting up your Firstscope AZ, start with the tripod and work up from there.

Locate the Altazimuth mount and the tripod legs along with the tripod mounting hardware and the tripod accessory tray.

1. Lie the tripod head on its side. Attach the three tripod legs one by one on the tripod head with the bolts and wing nuts. Do not overtighten the bolts but just make them finger tight. Remember to have each tripod leg in the right orientation with the tripod tray bracket facing inward.
2. Now set the tripod with the Altazimuth mount attached in the standing position by spreading the legs apart far enough for the tripod accessory tray to fit.
3. You are now ready to install the tripod accessory tray. The tripod tray bracket fits into the holes in the bottom of the tray (use the slots on the end of the brackets). Use the bolts and wing nuts to attach each bracket to the tray.

Setting Up the Aluminum Tripod

4. Tighten all bolts and wing nuts to ensure proper stability.

If your model has the Aluminum Tripod:

1. Attach the legs to the tripod head as above.
2. Spread the legs apart.

FIRSTSCOPE AZ

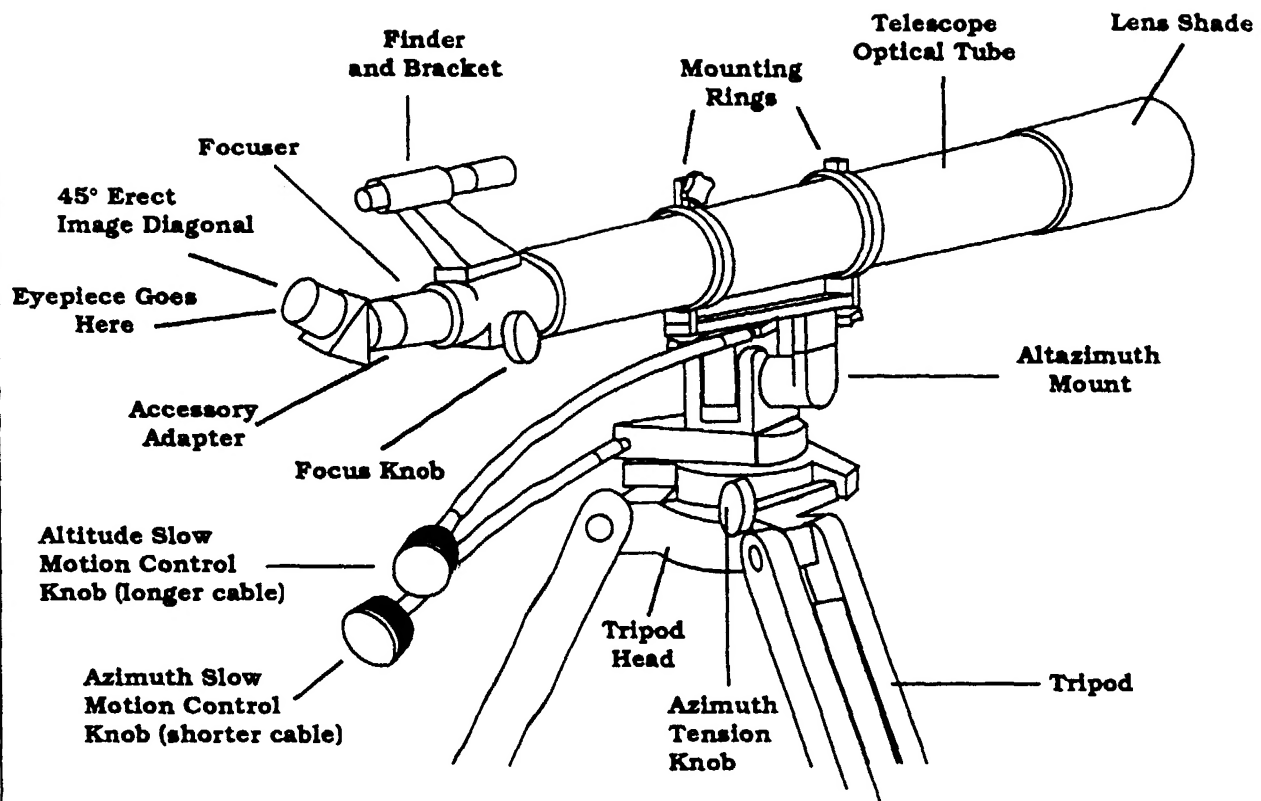


Figure 2-1

The Firstscope AZ fully assembled. Use this illustration and others throughout this manual, to familiarize yourself with the various parts of your Firstscope AZ telescope.

Adjusting the Tripod Height

3. Attach the accessory tray to the leg braces.
With the tripod set up, you can adjust the height of the tripod. To do this:

1. Loosen the wing nuts on the lower portion of the tripod leg.
2. Slide the center slat of the leg away from the tripod head until at the desired height.
3. Tighten the wing nut (completely) to hold the leg firmly in place. A wrench is provided to hold the bolt in place while you are turning the wing nut.

Repeat this process for each tripod leg.

Attaching the Slow Motion Control Knobs

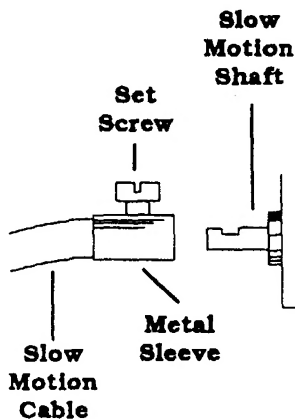


Figure 2-2

This illustration shows the correct orientation of the metal sleeve relative to the slow motion shaft.

You are ready to attach the slow motion control knobs.

1. Retract the set screw on the metal sleeve of the slow motion control knobs until it no longer extends into the inner diameter. The metal sleeve is on the opposite end of the cable from the slow motion knob.
2. Slide the end of the metal sleeve over one of the two shafts protruding from the mount. Make sure that the set screw on the metal sleeve is over the flat part of the shaft (see figure 2-2).

The shaft on the right side of the telescope platform controls altitude adjustments while the one on the left controls azimuth adjustments (see figure 2-3).

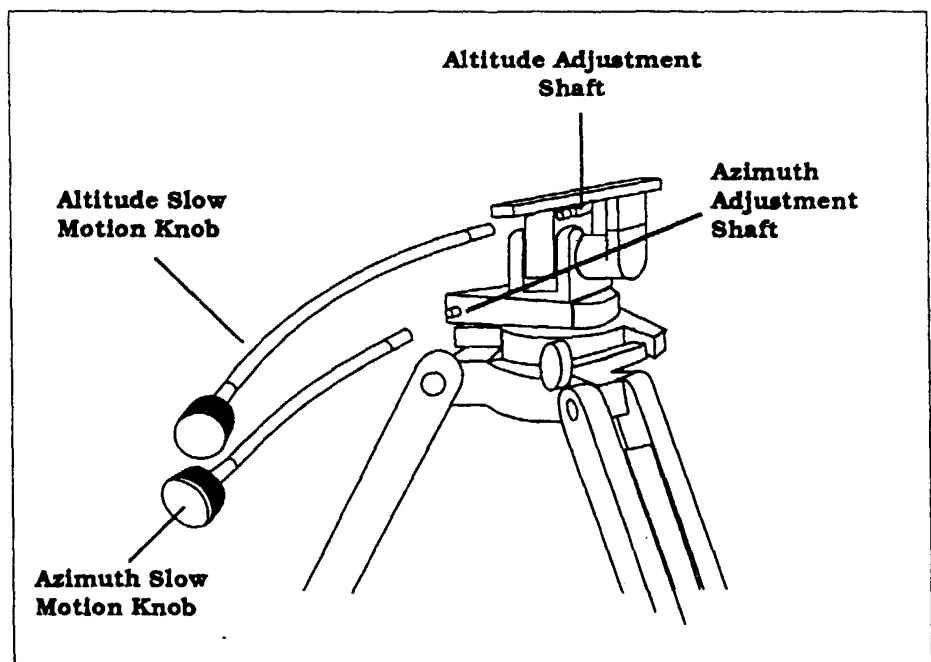


Figure 2-3

3. Tighten the set screws to hold the slow motion control cables in place.

Attaching the Telescope to the Mount

The optical tube is held to the mount with two mounting rings. On the bottom of the mounting rings are square extrusions — one on each ring. This portion of the ring slides over part of the mounting platform to hold the telescope in place.

1. Slightly loosen the screws that hold the mounting rings on the telescope in place.
2. Slide the rings apart so that each is toward a different end of the telescope. Ideally, the mounting rings should be slightly farther apart than the length of the mounting platform.

3. Place the telescope tube on the mount and orient it so that the objective lens is opposite the slow motion control handles.
4. Slide the rings together until the square extrusions fit over the ends of the mounting platform.
5. Tighten the bolt on the square extrusion on the ring closest to the objective lens to hold the telescope to the mount (C). This knob is on the opposite side of the mounting ring from the hand tightening knob.
6. Tighten the screws that hold the mounting rings in place (A and B). This will keep the telescope from sliding back and forth in the mounting rings.

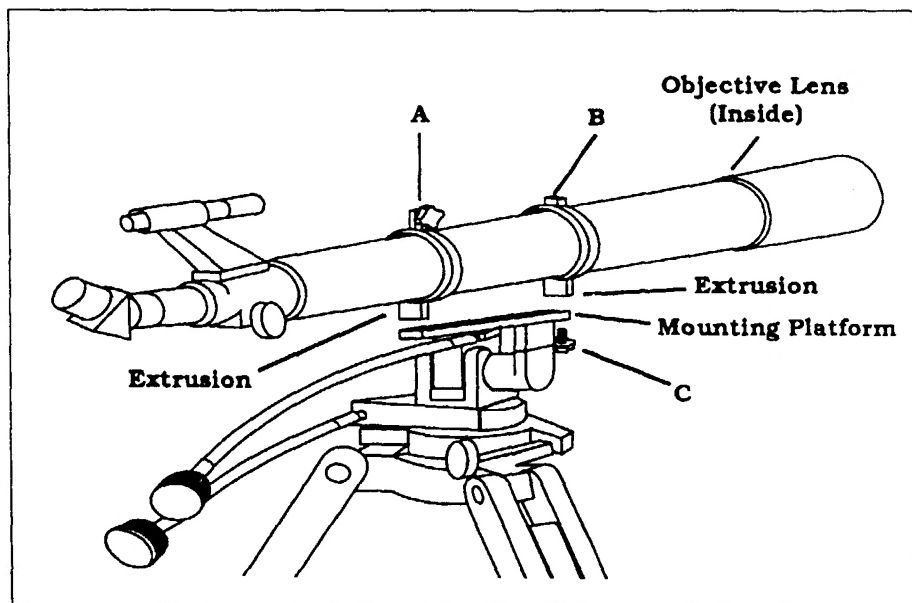


Figure 2-4

Orient the altazimuth mount so that it is parallel to the ground while mounting the telescope tube.

Pointing the AZ Telescope

The Altazimuth mount can be moved in two directions; vertically, which is called altitude and horizontally, which is called azimuth.

Altitude

- For major directional changes in altitude, hold the end of the telescope tube and move the telescope to the desired orientation.
- For fine adjustments in altitude, turn the slow motion control knob on the right side of the mount. Turning the knob clockwise lowers the angle at which the telescope is aiming while turning it counterclockwise raises the angle at which the telescope is aiming.

Azimuth

- For major directional changes in azimuth, loosen the azimuth tension knob on the right side of the mount. (This knob is already attached to the mount and does **NOT** need to be installed.) Once loose, point the telescope to the desired area and tighten the azimuth tension knob.

- For fine adjustments in azimuth, turn the slow motion control knob on the left side of the mount. Turning the knob clockwise moves the telescope to the right while turning it counterclockwise moves the telescope to the left.

NOTE: The azimuth slow motion knob will **NOT** work while the azimuth tension knob is loose. The azimuth tension knob must be fully tightened before you can use the azimuth slow motion control knob.

Disassembling and Transporting Your Firstscope AZ

Once assembled, the telescope can be left set up. The entire unit is light enough to pick up and carry outside for a casual observing session. If, however, you want to transport your Firstscope AZ to a remote observing location, you should partially disassemble your telescope for easy transportation.

1. Remove the optical tube from the altazimuth mount. Wrap the tube in cloth to prevent it from being scratched or dented. Perform the steps for attaching the telescope in reverse order.
2. Fold the tripod legs together. The mount does **NOT** have to be removed if you are transporting the telescope yourself.

You are now ready to transport the telescope to your observing site.

If you are shipping the telescope via a common carrier, you should completely disassemble the telescope and return all parts to the original shipping container.

T E L E S C O P E B A S I C S

Once your telescope has been fully assembled, you are ready to attach the accessories.

Attaching the Accessories

The Accessory Adapter

The accessory adapter is the short black tube with the set screw that allows the attachment of visual accessories (i.e., the star diagonal, erect image diagonal, eyepieces, etc.). The accessory adapter comes attached to the focus tube and is removed only when attaching photographic accessories.

Erect Image Diagonal

The erect image diagonal is a prism that diverts the light at a 45° angle to the light path of the telescope. In addition to placing the eyepiece in physically comfortable viewing positions, this accessory also provides correctly oriented images. To attach the erect image diagonal:

1. Loosen the thumbscrew on the accessory adapter until it no longer obstructs the inner diameter.
2. Slide the chrome portion of the erect image diagonal into the accessory adapter.
3. Tighten the thumbscrew on the accessory adapter to hold the diagonal in place.

If you wish to change the orientation to the erect image diagonal, loosen the thumbscrew on the accessory adapter until the diagonal rotates freely. Move the diagonal to the desired position and tighten the thumbscrew.

The Eyepieces

The eyepiece, or ocular, is an optical element that magnifies the image focused by the telescope. The eyepiece(s) fit into either the accessory adapter directly or into the erect image diagonal. To install an ocular:

1. Loosen the set screw on the erect image diagonal so that it does not obstruct the inner diameter.
2. Slide the chrome portion of the eyepiece into the diagonal.
3. Tighten the set screw.

To remove the ocular:

1. Loosen the set screw on the diagonal.
2. Slide the eyepiece out of the diagonal.

You can replace it with another ocular.

Eyepieces are commonly referred to by focal length, which is printed on the eyepiece barrel. The longer the focal length (i.e., the larger the number) the lower the power. Conversely, the shorter the focal length (i.e., the smaller the number) the higher the magnification. Generally, you will use low to moderate power when viewing. For more information on how to determine power, see the section on "Calculating Magnification."

In addition, eyepieces are also referred to by barrel diameter. These Celestron refractors use eyepieces with a barrel diameter of 1-1/4".

Focusing

To focus your telescope, simply turn either of the focus knobs located directly opposite the finderscope. Turn the focus knob until the image is sharp. Once sharp, turn the knob towards you to focus on an object that is closer than the one you are currently observing. Turn the knob away from you to focus on a more distant object than the one you are currently observing.

In addition to understanding how the focusing mechanism works, there are a few focusing hints to remember when using any optical instrument.

- Avoid looking through glass. Glass found in household windows is optically imperfect, and as a result, may vary in thickness from one part of a window to the next. This inconsistency can and will affect the ability to focus your telescope. In most cases, you will not be able to achieve a truly sharp focus. In some cases, you may actually see a double image.
- Never look across or over objects producing heat waves. This includes asphalt parking lots on hot summer days or building rooftops.
- Hazy skies, fog, and mist can also make it difficult to focus when viewing terrestrially. The amount of detail that can be seen under these conditions will be greatly reduced. Also, when photographing under these conditions, the processed film may come out a little grainier than normal.
- When using your telescope as a telephoto lens, the split screen or micro-prism focuser of the 35mm camera may "black out." This is common with all long focal length lenses. If this happens, use the ground glass portion of your focusing screen. To achieve a very sharp focus, you may consider using a focusing magnifier. These are readily available from your local camera store.
- If you wear corrective lenses (specifically glasses), you may want to remove them when observing with an eyepiece attached to the telescope. However, when using a camera, you should always wear corrective lenses to ensure the sharpest possible focus. If you have astigmatism, corrective lenses must be worn at all times.

Aligning the Finder

Accurate alignment of the finder makes it easy to find objects with the telescope, especially celestial objects. To make aligning the finder as easy as possible, this procedure should be done in the daytime when it is easy to find and identify objects. To align the finder:

1. Choose a target that is in excess of one mile away. This will eliminate any parallax effect between the telescope and finder.
2. Point the telescope at your target and center it in the main optics of the telescope. You may have to move the telescope slightly to center your target.

3. Adjust the screws on the finder bracket, tightening one while loosening another, until the crosshairs are centered on the target seen through the telescope.

Image orientation through the finder is inverted (i.e., upside down and reversed from left-to-right). This is normal for any finderscope that is used straight-through. Because of this, it may take a few minutes to familiarize yourself with the directional change each screw has on the finderscope.

Calculating Magnification

You can change the power of your Celestron telescope just by changing the eyepiece (ocular). To determine the actual magnification with any given eyepiece, simply divide the focal length of the telescope by the focal length of the eyepiece. In equation format, the formula looks like this:

$$\text{Magnification} = \frac{\text{Focal Length of Telescope (mm)}}{\text{Focal Length of Eyepiece (mm)}}$$

Let's take an example (using the 80mm AZ) to see how this formula works. Let's say you're observing with a 25mm eyepiece. To determine the magnification, you would simply divide the focal length of the telescope (910mm) by the focal length of the eyepiece. Since we are using a 25mm eyepiece for our example, you would divide 910 by 25. This yields a magnification of 36 power.

Although the power is variable, each instrument has a limit to the highest useful magnification. The general rule is that 60 power can be used for every inch of aperture. For example, the Firstscope 80 AZ is 3.14" (80mm) in diameter. Multiplying 3.14" by 60 gives a maximum useful magnification of 188 power. Although this is the maximum useful magnification, most observing is done in the range of 10 to 30 power for every inch of aperture which is about 30 to 100 power for the Firstscope 80 AZ.

Higher powers (more than 60x the diameter) can be used for looking at super enlarged images of the planets and the moon, but the images will be dark with little contrast, and somewhat fuzzy.

Your First Look

With the telescope fully assembled and all the accessories attached, you are ready for your first look. Your first look should be done in the daytime when it will be easier to locate the locking clamps and adjustment knobs. This will help to familiarize you with your telescope, thus making it easier to use at night.

Daytime Observing

1. Find a distant object that is fairly bright.
2. Insert the standard eyepiece into the diagonal.
3. Locate the object in the finderscope.
4. Use the slow motion knobs to center the object in the field of the finder.
5. Look through the main optics and the object will be there (if you aligned the finder first).

Try using different optional eyepieces to see how the field changes with various magnifications.

WARNING!

NEVER POINT YOUR TELESCOPE AT THE SUN UNLESS YOU HAVE THE PROPER MYLAR SOLAR FILTER. PERMANENT AND IRREVERSIBLE EYE DAMAGE MAY RESULT AS WELL AS DAMAGE TO YOUR TELESCOPE. ALSO, NEVER LEAVE YOUR TELESCOPE UNATTENDED DURING A DAYTIME OBSERVING SESSION, ESPECIALLY WHEN CHILDREN ARE PRESENT.

Observing the Sun, Moon, and Planets

WARNING!

Although overlooked by many amateur astronomers, solar observation is both rewarding and fun. However, because the Sun is so bright, special precautions must be taken when observing our star so as not to damage your eyes or your telescope.

Never project an image of the Sun through the telescope. Tremendous heat build-up near the back of the telescope can damage any accessories attached to the telescope.

Use a Celestron mylar solar filter to view the Sun in complete safety. These filters reduce the intensity of the Sun's light making it safe to view. With these filters you can see sunspots as they move across the solar disk and faculae, which are bright patches seen near the Sun's edge. **Be sure to cover the lens of the finder when observing the Sun. This will ensure that the finder is not damaged and that no one looks through it accidentally.**

In the night sky, the Moon is a prime target for your first look because it is extremely bright. Often, it is a temptation to look at the Moon when it is full. At this time, the face we see is fully illuminated and its light can be overpowering. In addition, little or no contrast can be seen at this time.

One of the best times to observe the Moon is during its partial phases (around the time of first or third quarter). Long shadows reveal a great amount of detail on the lunar surface. At low power you will be able to see the entire lunar disk at one time. Change to higher power (magnification) to focus in on a smaller area. Keep in mind that the rotation of the Earth will cause the Moon to drift out of your field of view. You will have to manually adjust the telescope to keep the Moon centered. This effect is more noticeable at higher power. Consult your local newspaper or current astronomy magazine to find out when the Moon is visible.

This same method can be used to observe the planets. You can see Venus go through its lunar-like phases. Mars will reveal a host of surface detail and one, if not both, of its polar caps. You will be able to see the cloud belts of Jupiter and the great Red Spot. In addition, you will also be able to see the Moons of Jupiter as they orbit this gas giant. Saturn with its beautiful rings is easily visible at moderate power. All you need to know is where to look. Most astronomy publications tell where the planets can be found in the sky each month.

Observing Deep-Sky Objects

Deep-sky objects are simply those objects outside the boundaries of our solar system. They include star clusters, planetary nebulae, diffuse nebulae, double stars and other galaxies outside our own Milky Way. The Celestron Sky Maps (#93722) can help you locate the brightest deep-sky objects. You can "star hop" to an object from an area with which you are familiar.

Most deep-sky objects have a large angular size. Therefore, low-to-moderate power is all you need to see them. Visually, they are too faint to reveal any color. Instead, they have a black and white appearance. And, because of their low surface brightness, they should be observed from a dark sky location. Light pollution around large urban areas washes out most nebula making them difficult, if not impossible, to observe. LPR filters enhance deep sky viewing from light polluted areas by blocking unwanted light while transmitting light from certain deep-sky objects. You can, on the other hand, observe planets and stars from light polluted areas or when the Moon is out.

Photography Hints

Your Celestron can be used for both terrestrial and astronomical photography. Celestron telescopes have fixed apertures and, as a result, fixed $f/ratios$. To properly expose your subjects photographically you need to set your shutter speed accordingly. Most 35mm cameras offer through-the-lens metering which will let you know if your picture will be under or over exposed. This is more of a consideration when doing terrestrial photography where exposure times are measured in hundredths of a second. In astrophotography, the exposures are much longer requiring that you use the "B" setting on your camera. The actual exposure time is determined by how long you keep the shutter open.

To reduce vibration when tripping the shutter, use a cable release. Releasing the shutter manually can cause vibration, something that can produce unsharp photos. A cable release will keep your hands clear of the camera and telescope, thus eliminating the possibility of introducing vibration. Mechanical shutter releases can be used, though air type releases are best.

In addition, remember the focusing hints described earlier in this manual.

Photographing the Moon

After looking at the night sky for a while you may want to try photographing it. If you do, start with a nice, bright object like the Moon.

Load your camera with film that has a moderate-to-fast speed (i.e., ISO rating). Faster films are more desirable when the Moon is a crescent. When the Moon is full, and at its brightest, slower films are more desirable. If photographing during the full phase, use a yellow filter to reduce the light intensity and to increase contrast. To attach your camera to the F80 AZ or C102-AZ, you will need the Celestron T-Adapter (#93634-A) and the T-Ring for your specific camera. On the F70 AZ, the T-Adapter is built in and you only need the T-Ring to attach your camera.

Consult the Celestron accessory catalog for a list of recommended exposure times. These exposure times should be used as a starting point. Always make exposures that are longer and shorter than the recommended time. Also, try bracketing your exposures. Take a few photos at each shutter speed. This will ensure that you will get a good photo.

Keep accurate records of your exposures. This information is useful if you want to repeat your results or submit them for possible publication in astronomical magazines!

TELESCOPE MAINTENANCE

Refractors are generally very low maintenance telescopes. Cleaning is really all that is needed, and even that is minimal if the telescope is stored properly.

Care and Cleaning of the Optics

Occasionally, dust and/or moisture may build up on the objective lens of your telescope. Special care should be taken when cleaning any instrument so as not to damage the optics. If dust has built up on the objective lens, remove dust with a camel's hair brush or a can of pressurized air. Spray at an angle to the lens for approximately 2 to 4 seconds. Then, use optical cleaning solution and white tissue paper to remove any remaining debris. Strokes should go from the center of the objective lens to the outer portion. Do **NOT** rub in circles! With refractive lenses, never apply the cleaning solution directly to the lens. Because the elements are air-spaced, excess solution may seep between the lenses. Apply the solution to the tissue, then the tissue to the lens.

You can use commercially made lens cleaner or mix your own. A good cleaning solution is isopropyl alcohol mixed with distilled water. The solution should be 60% isopropyl alcohol and 40% distilled water. Or, liquid dish soap diluted with water (a couple of drops per one quart of water) can be used.

Occasionally, you may experience dew build-up on the objective lens of your telescope during an observing session. This may be removed with a hair dryer or by pointing the telescope at the ground. Since your Celestron refractor has a built-in dew cap, the dewing process is slightly reduced. If moisture condenses on the inside of the lens, remove the accessories from the telescope. Place the telescope in a dust-free environment and point it down. This will remove the moisture from the telescope tube.

To minimize the need to clean your telescope, replace all lens covers once you have finished using it. Since the back of the telescope where the accessories attach is **NOT** sealed, the plastic cap should be placed over the opening when not in use. This will prevent contaminants from entering the optical tube.

Storing Your Telescope

When not in use, your Firstscope AZ can be left fully assembled and set up. However, all lens and eyepiece covers should be put back in place. This will reduce the amount of dust build-up on the optical surfaces and reduce the numbers of times you need to clean the instrument. You may want to return everything to its original shipping container and store them there. If this is the case, all optical surfaces should still be covered to prevent dust build-up.

Technical Specifications

Below is pertinent technical information on your Firstscope AZ telescope that you may find useful.

	C102-AZ	Firstscope 80 - AZ	Firstscope 70 - AZ
Optical System:	Refractor-Achromat	Refractor-Achromat	Refractor-Achromat
Aperture:	102mm (4.02")	80mm (3.14")	70mm (2.76")
Focal Length:	1000mm (39.4")	910mm (35.8")	900mm (35.4")
Near Focus			
With Eyepiece:	80'	32'	30'
With Camera:	95'	40'	40'
Highest Useful Power Magnification:	240x	189x	166x
Resolution (arc seconds) -			
Dawes:	1.14	1.45	1.65
Light Gathering Power:	212x	131x	100x
Limiting Visual Magnitude:	12.5	12.0	11.0
Angular Field of View in Degrees (with standard eyepiece):	1.0°	1.4°	1.4°
Linear Field of View (with standard eyepiece):	53'	73'	73'
F/ratio:	f/9.8	f/11.4	f/12.9
Length:	38.5"	36"	36"
Weight:			
Optical Tube:	8 lb.	5.5 lb.	3.5 lb.
With Tripod:	28 lb.	18 lb.	16 lb.

Note All specifications are stated for the telescope using the standard accessories. These specifications are approximate and subject to change without notice.

Optional Accessories

Celestron offers a large assortment of accessories for this telescope:

- Eyepieces
- Barlow Lenses
- Accessory Cases
- Dew Eliminator
- 90° Diagonal
- Eyepiece Filters
- LED Flashlights
- Solar Filter
- Moon Filter
- T-Adapter
- Sky Maps
- Planisphere & Planet Finder

The Celestron Accessory Catalog (#93685) has complete details on these and more accessories available for your telescope.

CELESTRON ONE YEAR WARRANTY

- A. Celestron International (CI) warrants this telescope to be free from defects in materials and workmanship for one year. CI will repair or replace such product or part hereof which, upon inspection by CI, is found to be defective in materials or workmanship. As a condition to the obligation of CI to repair or replace such product, the product must be returned to CI together with proof-of-purchase satisfactory to CI.
- B. The Proper Return Authorization Number must be obtained from CI in advance of return. Call Celestron at (310) 328-9560 to receive the number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement setting forth the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of CI.

The customer shall be responsible for all costs of transportation and insurance, both to and from the factory of CI, and shall be required to prepay such costs.

CI shall use reasonable efforts to repair or replace any telescope covered by this warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, CI shall notify the customer accordingly. CI reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void and of no force of effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

CI DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HEREIN.

THE SOLE OBLIGATION OF CI UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HEREIN. CI EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY CI PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF ONE YEAR FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitation and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

CI reserves the right to modify or discontinue, without prior notice to you, any model or style telescope.

If warranty problem arise, or if you need assistance in using your telescope contact:

**Celestron International
Customer Service Department
2835 Columbia Street
Torrance, CA 90503
Tel. (310) 328-9560
Fax. (310) 212-5835
Monday-Friday 8AM-4PM PST**

This warranty supersedes all other product warranties.

NOTE: This warranty is valid to U.S.A. and Canadian customers who have purchased this product from an Authorized CI Dealer in the U.S.A. or Canada. Warranty outside the U.S.A. and Canada is valid only to customers who purchased from a CI Distributor or Authorized CI Dealer in the specific country and please contact them for any warranty service.